

CITY OF FAIRFIELD

RESOLUTION NO. 2017 - 15

**RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FAIRFIELD AUTHORIZING
THE CITY MANAGER TO EXECUTE AN ENGINEERING SERVICES AGREEMENT
BETWEEN THE CITY OF FAIRFIELD AND WEST YOST ASSOCIATES FOR THE
HYDRAULIC MODEL UPDATE PROJECT – PHASE 2, MODEL DEVELOPMENT**

WHEREAS, the City of Fairfield has a need to develop a new water system hydraulic model for the purpose of performing water system planning, more accurately budgeting annual capital and maintenance expenditures, assisting with maintenance prioritization to extend the life of critical assets, and providing information that will be used to minimize long-term operations and maintenance costs; and

WHEREAS, West Yost Associates successfully completed Phase 1, Geographical Information System Updates, for the initial phase of this project; and

WHEREAS, staff is requesting professional engineering technical services from West Yost Associates for assistance in completing the water system hydraulic model development phase (Phase 2) of this project;

**NOW THEREFORE, THE COUNCIL OF THE CITY OF FAIRFIELD HEREBY
RESOLVES:**

Section 1. The City Manager is hereby authorized and directed to execute on behalf of the City of Fairfield an Agreement between the City of Fairfield and West Yost Associates for the Hydraulic Model Update Project – Phase 2, Model Development for a total not-to-exceed fee of \$299,350.

PASSED AND ADOPTED this 17th day of January, 2017, by the following vote:

AYES: COUNCILMEMBERS: PRICE/TIMM/BERTANI/MOY/VACCARO
NOES: COUNCILMEMBERS: NONE
ABSENT: COUNCILMEMBERS: NONE
ABSTAIN: COUNCILMEMBERS: NONE

Nam, t. Puis

ATTEST:

John H. Bly, Deputy
CITY CLERK
pw

CONSULTANT SERVICES AGREEMENT

Hydraulic Model Update Project – Phase 2, Model Development

THIS AGREEMENT is made at Fairfield, California, as of January 24, 2017, by and between the City of Fairfield, a municipal corporation (the "CITY") and WEST YOST ASSOCIATES ("CONSULTANT"), who agree as follows:

1) **SERVICES.** Subject to the terms and conditions set forth in this Agreement, CONSULTANT shall provide to the CITY the services described in Exhibit "A," which consists of the proposal submitted by CONSULTANT. CONSULTANT shall provide said services at the time, place, and in the manner specified in Exhibit "A."

2) **PAYMENT.** CITY shall pay CONSULTANT for services rendered pursuant to this Agreement at the times and in the manner set forth in Exhibit "B." The payments specified in Exhibit "B" shall be the only payments to be made to CONSULTANT for services rendered pursuant to this Agreement. CONSULTANT shall submit all billings for said services to the CITY in the manner specified in Exhibit "B."

3) **FACILITIES AND EQUIPMENT.** CONSULTANT shall, at its sole cost and expense, furnish all facilities and equipment which may be required for furnishing services pursuant to this Agreement.

4) **GENERAL PROVISIONS.** The general provisions set forth in Exhibit "C" are part of this Agreement. In the event of any inconsistency between said general provisions and any other terms or conditions of this Agreement, the provisions set forth in Exhibit "C" shall control.

5) **INSURANCE REQUIREMENTS.** The insurance requirements set forth in Exhibit "D" are part of this Agreement. In the event of any inconsistency between said general provisions and any other terms or conditions of this Agreement, the requirements set forth in Exhibit "D" shall control.

6) **EXHIBITS.** All exhibits referred to herein are attached hereto and are by this reference incorporated herein.

7) **TERM.** This agreement shall be in effect until the scope of work is completed.

EXECUTED as of the day first above-stated.

City of Fairfield, a municipal corporation

By:


David A. White
City Manager

CONSULTANT

By:





October 31, 2016

SENT VIA: EMAIL

Mr. Felix Riesenbergs
City of Fairfield
Public Works Department
1000 Webster Street
Fairfield CA 94533

SUBJECT: Scope of Work for the Hydraulic Model Update Project—Phase 2, Hydraulic Model Development

Dear Mr. Riesenbergs:

In response to your request, West Yost Associates (West Yost) is pleased to provide our proposed Scope of Work for engineering services for Phase 2 of the Hydraulic Model Update Project. In Phase 2, West Yost will work with the City of Fairfield (City) to develop a new hydraulic model of the City's water distribution system using the recently updated Geographical Information System (GIS) that West Yost developed as part of Phase 1 of this overall project.

SCOPE OF WORK

Based on our discussions with City staff, our knowledge of your water supply, water system and our expertise in developing and using hydraulic models to perform analysis of existing and proposed water systems, West Yost has prepared this detailed Scope of Work outlined as follows:

- Task 1. Build Hydraulic Model
- Task 2. Hydraulic Model Calibration and Verification
- Task 3. Prepare Model Development Technical Report
- Task 4. Post Calibration Model Scenario Setup
- Task 5. Provide On-call GIS Engineering Services
- Task 6. Project Management/Meetings

Optional Tasks:

- Task 7. Unidirectional Flushing Program Development
- Task 8. Water Quality Modeling

Activities associated with each of these tasks are discussed in detail below.

Task 1. Build Hydraulic Model

The purpose of this task is to develop a complete computerized hydraulic simulation system model of the City's potable water distribution system that can be used as an operational and planning tool. This model will accurately reflect the existing backbone transmission/distribution main configuration and current operating conditions.

An existing hydraulic model of the City's system was developed previously. This model was developed prior to the City's implementation of GIS. It is intended to use the model as a top-level reference to review information such as key facilities data and/or C-values. However, this task will develop a new model from the recently updated City water distribution system geodatabase.

The model will be developed using Innovyze's InfoWater® Suite software, and will be a fully calibrated and verified extended period simulation (EPS) model that will make full use of InfoWater® Suite's available features. From recent and relevant experience, we have developed an approach which will provide the City with a hydraulic model that can meet all of the City's current and future needs.

Activities for this task were divided into five separate subtasks, each is described below.

Task 1.1: Identify Elements to be Included in the City's Model

West Yost will develop working maps of proposed modeled pipelines and nodes. The model will include all potable water distribution system pipelines, and to be representative of the hydraulics of the existing City's potable water distribution system.

Following our in-depth review of the water system with City engineering and operational staff, West Yost will work with City staff to identify those pipelines and specific areas of the City's water system which require special attention. Since the GIS update was completed in Phase 1, it is anticipated that most areas of focus will be at key facilities, such as pump stations and tanks, which are typically not represented in detail in the GIS. However, the City has delayed updating their GIS until the model development is completed. Therefore, there may be additional updates that West Yost will need to add to the GIS, prior to identification of elements to include in the City's model. West Yost has assumed an additional 80 hours of time to accomplish these updates, in addition to the hours required to identify elements to be included in the City's model. West Yost will also work closely with City staff to review and refine a nodal and pipeline naming convention, which will meet both existing and future needs while maintaining a relationship to the City's GIS.

Additionally, West Yost will work with the City's GIS staff to develop standards in which future water system configurations can be applied to the City's GIS to ensure that the new water system is set up in a format that can be easily incorporated into the GIS and modeling software.

Task 1.2: Import Water System Geodatabase into Hydraulic Model

After the nodal and pipeline naming conventions are established, West Yost will review the data for the City's potable water distribution system facilities (pump stations, tanks, and control valves) and pipeline infrastructure. West Yost and City staff will confirm and update any pipelines and/or facilities that have not have been included in the geodatabase. West Yost will then populate the

elevation database using Innovyze's Smart Topography feature, which will allow West Yost to directly extract attribute data from elevation data of the City's area and allocate them to their corresponding junctions in the model. West Yost will use high resolution LiDAR data for the areas of the City it is available. For the areas of the City LiDAR data is not available, West Yost will use either existing contour data or work with the City to obtain surveyed elevation data.

Task 1.3: Develop and Allocate Existing Demands into Hydraulic Model

West Yost understands that the City currently has existing meter/consumption data for all services, and that all services are coupled to either an address or Assessor's Parcel Number (APN) and a customer class designation. West Yost can easily correlate the meter/consumption service location to the GIS feature class of meters developed in Phase I.

Assuming the data is fairly free of errors (e.g., misspelled street names or extra characters in the street numbers), West Yost can then use this data, in conjunction with the meter GIS feature class, to produce a meter/consumption GIS file containing the City's existing water demands and revenue class designations.

Once the meter/consumption GIS file of the City's existing water demands is completed, West Yost will then use the Demand Allocation/ProTM Module (Allocation Module) of InfoWater® to automatically allocate meter/consumption data to individual junctions in the hydraulic model. The Allocation Module determines the demand at each junction by identifying and summing all the meter/consumption data located within an associated service area meter allocated to closest the pipeline.

Task 1.4: Diurnal Pattern Development and Integration

To be able to create and verify an EPS analysis of the City's potable water system, diurnal water use patterns are required. Working with City staff, West Yost will use information provided by the City to develop two diurnal curves for the City's potable water system – one representing Maximum Demand Day and one representing Minimum Demand Day. The diurnal curves will be developed for the City's five main zones, depending on data availability. To enable West Yost to create these composite diurnal curves, the City will need to provide flow from the following:

- Hourly flows from both water treatment plants, and booster pump stations;
- Hourly flows through zone pressure reducing valves (PRVs); and
- Hourly fluctuation in levels from the City's active storage reservoirs.

West Yost will need data for a minimum seven (7) consecutive day period.

It is assumed that the City can provide all data requested for West Yost's use in developing the composite Maximum Day and Minimum Day diurnal curve in electronic format. This might require additional flow monitoring by the City if there are key locations that are not recorded in SCADA. All of this data will be used to develop diurnal patterns to integrate into the hydraulic model. If the City can provide the data to develop diurnal curves for specific users (e.g. large users, such as Anheuser Busch) in electronic format, individual diurnal curves for specific users with unique demand characteristics can be developed as part of this task.

Task 1.5: Prepare Modeling Notebook

West Yost will provide the City with a “modeler’s notebook” which will document all of the details for each of the facilities simulated in the hydraulic model. The intent of this notebook is to provide the City with a means to evaluate what West Yost has incorporated into the hydraulic model, and also to provide the City with a “living” reference that it can use both in-house with its modeling staff and/or provide to outside parties who will be running the City’s model.

One of the key elements of Task 1.5 is a memorandum that describes the existing model and how to use the various data sets and scenarios which have been developed in Task 4. This technical memorandum (TM) will serve as an introduction to the Modeler’s notebook and can be thought of as a user’s manual to the City’s hydraulic model. It will also provide the reader with enough information that if they do open the models, they can easily navigate through the existing scenarios and develop additional scenarios with the existing data sets.

Task 1 Deliverables: Two (2) hard copies and one (1) electronic copy of the final Modeler’s Notebook.

Task 2. Hydraulic Model Calibration and Validation

West Yost will work closely with City staff to obtain the necessary data to calibrate and verify the newly-completed hydraulic model of the City’s potable water system. West Yost proposes the following calibration and validation activities:

Model Calibration: West Yost will perform both static and extended period calibration of the model. Static calibration will involve adjusting the model to match observed field conditions for hydrant testing specifically designed to gather information on pipes of different material types and ages within the system through the use of flow testing isolating pipelines of specific materials and age. Extended period calibration will be performed for a one-day period following the hydrant testing. West Yost proposes using hydrant pressure recorders to collect supplemental pressure data during hydrant testing, and for two days following hydrant testing.

Model Validation: Validation will consist of static and EPSSs to validate the performance of the calibrated model. The validation will use supplemental hydrant flow test data set where tests are performed to test hydraulic capacity of the distribution network without closing valves to isolate pipelines of specific material types. Extended period validation will be performed for maximum demand day and minimum demand day conditions, to bracket the range of anticipated normal operating conditions. To accomplish the calibration and validation, the following three sub-tasks will be performed.

Task 2.1: Perform Hydrant Flow Testing

With the assistance of City personnel, West Yost will perform hydrant testing at various locations to determine/confirm the roughness coefficient (C-factors) used to calibrate and validate the hydraulic model. West Yost staff (2 persons) will conduct the hydrant testing with City staff (three to five City staff), evaluate the field data, and determine appropriate C-factors based on pipeline age, size and material. City staff will be responsible for operating/closing valves, de-chlorination, and traffic control during these tests.

As discussed above, two types of hydrant test data will be collected. The majority of flow tests (approximately 15 to 20) will be conducted with the purpose of isolating pipelines of particular material and age, to determine C-factors used in the hydraulic model. These tests will be similar to uni-directional flushing (UDF) operations, where valves are closed to direct flow through particular pipelines. These tests will be supplemented with ‘standard’ fire flow tests (approximately 5), similar to those performed by operational staff or fire departments that assess system capacity through flow and pressure measurements. These supplemental tests will be used during the model validation to confirm the C-factors assigned to the model.

Prior to conducting the hydrant testing, West Yost will work closely with City staff and local fire officials to select the location of the tests. West Yost will provide the City with a proposed testing plan showing planned testing and data collection locations, locations of hydrant pressure recorders (HPRs) that will be used to collect supplemental pressure data, and valves to be closed, for tests requiring isolation of pipelines.

Task 2.2: Calibrate the Hydraulic Model

In this subtask, the model will be calibrated using: 1) the hydrant test data collected for the purpose of determining C-factors (approximately 15 to 20 tests performed by isolating valves of specific materials and age), and 2) a single EPS scenario to be determined in consultation with the City. The calibration to hydrant test data will be a series of static scenarios to compare modeled pressures with observed pressures under stressed conditions.

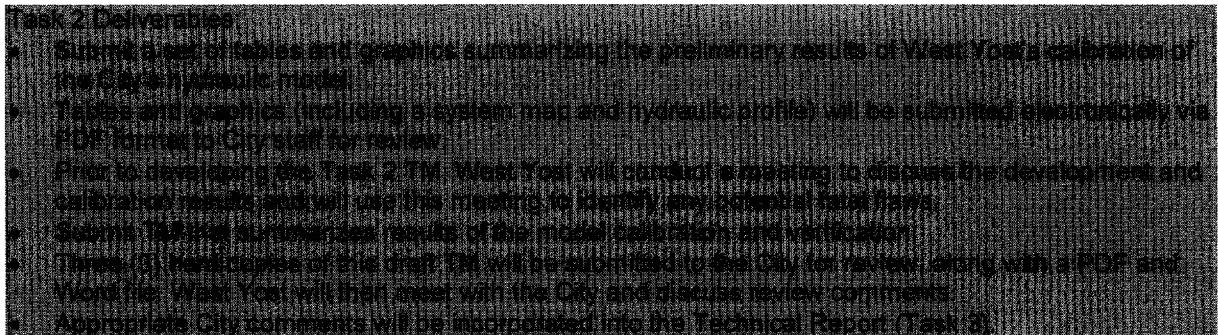
The calibration using supplemental pressure data collected after completion of hydrant testing will be an EPS scenario, set up using the logic controls and rules that govern facilities operation. West Yost proposes that the calibration scenario be conducted for a day during an approximately one-week to two-week period following hydrant testing. West Yost will deploy HPR’s to collect supplemental pressure data that can be used for the hydrant test and EPS calibration. A suitable calibration day would be selected from the one- to two-week period following hydrant testing, when HPR data are collected. The City will be responsible for providing West Yost with hourly pressure and flow data from system facilities for both the hydrant testing days and the one- to two-week period when supplemental pressure monitoring is conducted. After the static calibration is completed and the C-factors confirmed, West Yost will perform the EPS for a 24-hour period corresponding with the collection of supplemental pressure monitoring data. Using the data collected above, West Yost will verify that the newly created model generally mimics the filling and emptying of selected reservoirs, the on/off cycle of selected pump stations and that the pressures at selected areas throughout the City’s service area generally simulate the observed trends during a 24-hour period.

Task 2.3: Validate the Hydraulic Model

In this subtask, the model will be validated using: 1) hydrant test data collected for the purpose of assessing system available flow capacity (5 tests performed without operation of isolation valves), and 2) two EPS scenarios for a historical minimum and maximum day to be provided by the City. Since the City desires the model to be able to run EPSs during a minimum and maximum day demand condition, it will be critical to perform a dynamic verification of the model for both of these conditions.

Task 2 budgeting assumes the following:

- Hydrant testing would be performed over a two-day period.
- City staff will visit hydrant test locations ahead of time to verify hydrant operations and locate and exercise valves to be operated during tests.
- Model EPS calibration and validation will be performed for five zones, as identified with the City during the development of diurnal curves, in Task 1.



Task 3. Prepare Model Development Technical Report

The purpose of this task is to develop a water model development technical report. West Yost will integrate the City's comments to the previously submitted draft TM that have been prepared in the above tasks. The draft report will include the final versions of the TM developed for Tasks 1 and 2. Five (5) copies of the draft will be submitted to the City.

Following the City's review of the draft report, a formal meeting will be held to discuss review comments and questions. After receiving review and responding to comments from the City, a PDF check-print for the draft report with the changes will be provided to the City for final review. Once the PDF check-print is accepted, three (3) copies of the final report will be prepared and submitted to the City. Included with the final deliverables are the following:

- Three hard copies in a white 3-ring "D" binder
- Electronic copies of the final report, including:
 - Original text format (e.g., MicroSoft Word)
 - Electronic format (PDF)
- InfoWater® hydraulic model and associated model database
- Fire flow test related materials (e.g., test plan, field records, original electronic pressure data files)
- Model development data for calibration days



Task 4. Post Calibration Model Scenario Setup

West Yost will develop up to six (6) separate scenarios to include into the updated hydraulic model's scenario manager. These scenarios will be developed in consultation with the City and could include the following:

- Existing Maximum Day Demands (MDD) (static simulation)
- MDD Plus Fire Flow (static simulation)
- Existing Peak Hour Demands (PHD) (static simulation)
- EPS MDD
- Average Day Demand (ADD) (static simulation)
- Winter-Time (minimum day) EPS

For budgetary purposes, West Yost has assumed that up to four of these scenarios will be under static conditions and up to two will be under EPS conditions. West Yost will develop a brief TM summarizing each scenario and what it represents so City staff will know how to utilize each in the future.



Task 5 – Provide On-call GIS Engineering Services

Work under this task will include providing the City with engineering support related to the City's recently developed GIS geodatabase. If requested by the City, West Yost would provide the following engineering support functions:

- Integrating newly constructed water distribution system facilities into the City's GIS geodatabase
- GIS data creation/manipulation including:
 - GPS field collection and processing
 - Importation/processing of existing collected data
- Map/atlas production
 - Assisting City personnel in creation/use/assimilation
- Topology analysis & review
 - Provide training/assistance to City personnel in use of topology toolsets
- Attendance and/or presentations at meetings with City staff, other City Consultants, Developer Representatives, or City Committees
- Other assignments as requested by City staff

For budgetary purposes, West Yost has estimated up to approximately 100 hours of on-call engineering support.

Task 5 Deliverables: Work products dependent on requested services

Task 6 – Project Management/Meetings

This task includes the following meeting and project management activities:

- Three (3) meetings:
 - Kickoff
 - Task 1 meeting regarding existing facilities operation
 - Closeout meeting to provide final deliverables
- Bi-Weekly conference calls or live meetings over the scheduled 10-month project span (16 calls assumed)
- Monthly progress reporting and invoicing over the scheduled 10-month project span
- Job set up and close

Task 6 Deliverables: Meeting agendas and notes

OPTIONAL SERVICES TASKS

Optional UDF flushing program development and water quality modeling tasks are listed below. The hours and budget associated with the following items can be found in Table 1 and Attachment B.

Task 7. Unidirectional Flushing Program Development

Per our discussions with you, we understand that the City's specific objective for this task is to refine and confirm the ongoing implementation of a system-wide flushing program for the water distribution system. The City has requested that West Yost use the hydraulic model of the City's water system to develop a UDF pilot program to assist in refining, planning and implementing a system-wide UDF flushing program.

Based on our review and discussions with City staff, experience in developing UDF programs, understanding of the City's water system, and our experience in using hydraulic models of water distribution systems, we have prepared our proposed scope of work detailed below.

Task 7.1: Develop UDF Pilot Test for Worst Case Areas

The primary purpose of Task 7.1 will be to update the City's water system in the locations identified by the City for the UDF pilot test study area. West Yost will meet with the City to discuss the general areas that are currently being considered as potential pilot flushing areas. The goal of this meeting will be to confirm the boundary for the UDF area(s) to be used in the UDF Project. To provide the City estimation of the system-wide flushing program, West Yost recommends identifying two UDF Study Areas which encompass one area that is considered to be a difficult area to be flushed and one area that is considered to be an easy area to be flushed. These two study

areas will provide a bookend to the City for time and budget planning. For budgetary purposes, West Yost assumes participation of two West Yost staff for two (2) hours. To provide an effective UDF Project, all pipelines within the UDF Study Area should be included in the hydraulic water system model prior to developing the program.

Task 7.1 Deliverables: West Yost will submit two complete sets of the overview map and detailed flush journals for the pilot test study areas.

Task 7.2: Water System UDF Program

West Yost will use the City's updated hydraulic model and utilize the InfoWater® UDF Module to identify sequences, valves to be opened or closed, and to assure that adequate water and pressures are available to attain desired flushing velocities. The UDF Project will be designed using the following criteria:

- Pipeline diameter to be flushed includes 4-inch through 12-inch diameter pipeline.
- Minimum and desired flush volumes are 1 and 3 volumetric turnovers, respectively.
- Desired pipeline flushing length is 1,200 feet or less based on standard UDF practice; however, it might not be applicable to the UDF Study Area. Desired pipeline flushing will be determined using the UDF Module.
- Maximum flushing length up to 1,800 feet, if necessary. This criterion might not be applicable to the UDF Study Area.
- Minimum required residual pressure (at each flowing hydrant) during flushing is 20 pounds per square inch (psi).
- Minimum required system pressure within each flush zone during flushing is 30 psi.
- Optimal flushing velocity ranges from 5 feet per second (ft/s) to 10 ft/s (shown below).

1.0 ft/s	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
Inadequate Velocity (less than 3 ft/s)	Acceptable Non-Optimal (3-5 ft/s)					Optimal Range (5-10 ft/s)				Acceptable Non-Optimal (10-12 ft/s)	Velocity Too High (over 12 ft/s)
						Acceptable Range (3-12 ft/s)					

West Yost will use the UDF Module to develop and identify which fire hydrants and valves should be manipulated for proper cleaning and scouring of pipelines. Excessive pressure drops will be avoided and no customers will be cut off from a supply of water. Sequences will generally progress from a clean source to the periphery of the system, and from large diameter mains to small diameter mains.

West Yost will use a key design goal in the development of the UDF sequences by minimizing hydrant and valve operations (to increase efficiency of the field crew time), while achieving an optimum velocity for pipeline scouring and cleaning. Each sequence will be designed so that all pipeline segments experience the target velocity to the extent possible. In some cases, hydraulic limitations may prevent adequate velocities. Typically 2 to 5 percent of pipelines (by length)

experience velocities less than the optimum velocities. West Yost will use industry best practices to balance the sequences to flush as many feet of pipeline as possible within the UDF sequences.

The following items will be computed (by West Yost) for each sequence: minimum flushing time, total flushing volume and pipeline length, flushing velocity of every pipeline in the sequence, and available flow at the minimum residual pressure. The hydraulic impact of each flushing sequence is also monitored to ensure that the desired minimum pressure is maintained throughout the flush zone.

West Yost will provide two levels of UDF mapping: an overview map for each flush area and a detailed flush journal for each UDF sequence. Overview maps show the flush sequences grouped and color-coded in sequential order. These maps allow planning of field personnel deployment, equipment needs, and, in an emergency, help to quickly determine which sequence(s) should be flushed.

Detailed flush journals will contain information on the hydrant(s) being flushed and the valve(s) that require operation. Background layers for the maps will utilize a roads layer to display street names and a parcels/building layer to display parcel/building boundaries, depending on availability. All maps will be provided in PDF format.

These maps will be provided to the City's water operations staff to conduct the actual pipeline flushing field activities.

Task 7.2 Detailed Maps: West Yost will submit two complete sets of the overview map and detailed flush journals.

Task 7.3: Pilot Program Implementation and Evaluation

West Yost will assist City staff during pilot program implementation, and to review collected data during the flushing program. City staff will collect and document the chlorine residual, turbidity, pH, and temperature before and after each flush.

West Yost will review any required assumptions with City staff (via phone or e-mail) before implementation. Any sequences that require attention for review and discussion will be sent to the City for resolution. Sequences which meet all design criteria will be submitted to the City's project manager.

A two (2) hour meeting between West Yost and City staff will be scheduled following the completion of the UDF sequence designs to plan UDF field work. This meeting is intended to transfer knowledge prior to UDF being carried out in the field.

West Yost will provide a final summary report documenting work completed including methodology used to develop the UDF sequence maps, inputs used, and basic UDF statistics.

West Yost assistance in the field during program implementation will be limited to the first day that field flushing is initiated for each pilot area (up to two days). This field time by West Yost staff will provide oversight and general guidance to the field crews during the initial flushing sequence, and demonstrate how the information is documented in the detailed flush journals for review after the completion of the entire flushing program.

West Yost will plan for a maximum of four (4) hours of re-work based on preliminary field results. Re-work is anticipated if valves or hydrants that have been included in UDF plans cannot be found or are not usable. The City will note the sequence number and location and unique ID of the asset that cannot be used, and inform West Yost immediately. West Yost will rework the sequence(s) and provide an alternate suggestion for execution in the field. Every effort will be made to rework the sequence during the same work day, and within 1-2 business days at the latest.

After the completion of the initial pilot UDF sequences as part of the Project by City staff and the submittal of all related field data to West Yost by City staff, West Yost will review the field results. If our review indicates that field results appear to be inconsistent and/or questionable, a conference call will be arranged between West Yost staff and City staff to discuss the field data and to determine if additional field flushing by City staff is required.

[Task 7.3 Deliverables: Field CRM / map books (flushing journals) with step-by-step procedures for the UDF Phase 1 flush and clean work]

Task 8. Water Quality Modeling

Two types of water quality evaluations are recommended to be conducted to evaluate water quality impacts – source tracing and water age. Source tracing can be used to evaluate areas of the system that receive only Waterman Treatment Plant (WTP) supply (source water from Lake Berryessa), a blend of WTP water and North Bay Regional Water Treatment Plant (NBR) water (source water from Sacramento-San Joaquin Delta), or only NBR water. Results from water quality modeling for different seasonal scenarios can be used to characterize the source blends in different pressure zones for different seasons.

Water age evaluations can be used as a surrogate for low chlorine residuals in the system, since water age is a key factor in loss of residual, though there are many other factors that can come into play.

West Yost will conduct EPS water quality evaluations for winter, transitional, and maximum day operating conditions. Water quality evaluations will be performed for water age or chlorine residual, and for source tracing. The water age or chlorine residual will evaluate the effects of distribution system residence time on chlorine residual. The source tracing will identify blend ratios of separate treated surface water sources in different parts of the system and how they change over time to identify areas where residual management may be more challenging due to blending. A total of six scenarios (three for water age/chlorine, three for source tracing) will be evaluated.

A meeting will be held with the City to discuss results of evaluation.

West Yost will prepare a TM documenting the results of the analysis. The TM will rely heavily on graphics to present the results and recommendations, supported by the technical details of the analysis. West Yost will finalize the report based on City comments.



BUDGET AND SCHEDULE

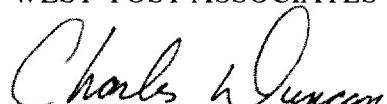
West Yost will perform the Scope of Work described above on a time and materials basis at the billing rates set forth in West Yost's attached Billing Rate Schedule (Attachment A), for a not-to-exceed budget of \$238,175 for the base scope of services, or \$299,350 including the Optional Services. Table 1 lists the budget and hours per task. Attachment B includes a more detailed breakdown of the project budget for the base scope of services.

Table 1. Budget Summary for Hydraulic Analysis		
Task	Hours	Dollars
Task 1 – Hydraulic Model Construction	365	63,575
Task 2 – Model Calibration and Validation	487	94,275
Task 3 – Prepare Technical Report	170	31,675
Task 4 – Post Calibration Scenario Setup	36	6,950
Task 5 – On-Call GIS Engineering Services	100	16,400
Task 6 – Project Management/Meetings	111	25,300
Totals – Base Scope of Work	1,269	\$238,175
Task 7.1 – Optional Unidirectional Flushing Pilot Program	176	34,000
Task 7.2 – Optional Water Quality Monitoring	136	27,175
Totals, Optional Services Task	312	\$61,175
Totals, Base Scope of Work Plus Optional Services Task	1,581	299,350

West Yost has budgeted assuming a schedule of 10 months for the Phase 2 work. Please do not hesitate to call if you have any questions or need additional information.

Sincerely,

WEST YOST ASSOCIATES


Charles T. Duncan, PE
President

CTD:PB:Ih

Attachment A – West Yost Associates 2017 Billing Rate Schedule
Attachment B – Detailed Budget



2017 Billing Rate Schedule

(Effective January 1, 2017 through December 31, 2017)*

POSITIONS	LABOR CHARGES (DOLLARS PER HR)
ENGINEERING	
Principal/Vice President	\$258
Engineering/Scientist/Geologist Manager I / II	\$237 / \$248
Principal Engineer/Scientist/Geologist I / II	\$216 / \$229
Senior Engineer/Scientist/Geologist I / II	\$193 / \$203
Associate Engineer/Scientist/Geologist I / II	\$172 / \$184
Engineer/Scientist/Geologist I / II	\$139 / \$161
Engineering Aide	\$78
Administrative I / II / III / IV	\$71 / \$89 / \$108 / \$118
ENGINEERING TECHNOLOGY	
Engineering Tech Manager I / II	\$236 / \$245
Principal Tech Specialist I / II	\$217 / \$226
Senior Tech Specialist I / II	\$198 / \$208
Senior GIS Analyst	\$189
GIS Analyst	\$178
Technical Specialist I / II / III / IV	\$123 / \$142 / \$160 / \$179
CAD Manager	\$150
CAD Designer I / II	\$116 / \$130
CONSTRUCTION MANAGEMENT	
Senior Construction Manager	\$246
Construction Manager I / II / III / IV	\$150 / \$161 / \$171 / \$214
Resident Inspector (Prevailing Wage Groups 4 / 3 / 2 / 1)	\$130 / \$145 / \$161 / \$167
Apprentice Inspector	\$118
CM Administrative I / II	\$64 / \$86

- Technology and Communication charges including general and CAD computer, software, telephone, routine in-house copies/prints, postage, miscellaneous supplies, and other incidental project expenses will be billed at 6% of West Yost labor.
- Outside Services such as vendor reproductions, prints, shipping, and major West Yost reproduction efforts, as well as Engineering Supplies, etc. will be billed at actual cost plus 15%.
- Mileage will be billed at the current Federal Rate and Travel will be billed at cost.
- Subconsultants will be billed at actual cost plus 10%.
- Expert witness, research, technical review, analysis, preparation and meetings billed at 150% of standard hourly rates. Expert witness testimony and depositions billed at 200% of standard hourly rates.
- A Finance Charge of 1.5% per month (an Annual Rate of 18%) on the unpaid balance will be added to invoice amounts if not paid within 45 days from the date of the invoice.

* This schedule is updated annually



2017 Billing Rate Schedule (continued)

(Effective January 1, 2017 through December 31, 2017)*

Equipment Charges

EQUIPMENT	BILLING RATES
Gas Detector	\$80/day
Hydrant Pressure Gage	\$10/day
Hydrant Pressure Recorder, Standard	\$40/day
Hydrant Pressure Recorder, Impulse (Transient)	\$55/day
Trimble GPS – Geo 7x	\$220/day
Vehicle	\$10/hour
Water Flow Probe Meter	\$20/day
Water Quality Multimeter	\$185/day
Well Sounder	\$30/day

* This schedule is updated annually

EXHIBIT "B"

PAYMENT

1) The total contract price for services rendered by CONSULTANT under this Agreement shall not exceed Two Hundred Ninety-Nine Thousand Three Hundred Fifty Dollars (299,350).

2) Payment shall be made to CONSULTANT on a time and materials basis, and CONSULTANT shall submit monthly invoices to the City for the same.

3) Any additional meetings or work required beyond that set forth in Exhibit "A" shall be mutually agreed to in writing (letter or e-mail) by the CITY and CONSULTANT, and shall be billed on a time and materials basis to the City of Fairfield.

EXHIBIT "C"

GENERAL PROVISIONS

1) **INDEPENDENT CONSULTANT.** At all times during the term of this Agreement, CONSULTANT shall be an independent contractor and shall not be an employee of CITY. CITY shall have the right to control CONSULTANT only insofar as the results of CONSULTANT's services rendered pursuant to this Agreement; however, CITY shall not have the right to control the means by which CONSULTANT accomplishes services rendered pursuant to this Agreement.

2) **LICENSES; PERMITS; ETC.** CONSULTANT represents and warrants to CITY that CONSULTANT has all licenses, permits, qualifications, and approvals of whatsoever nature which are legally required for CONSULTANT to practice CONSULTANT's profession. CONSULTANT represents and warrants to CITY that CONSULTANT shall, at its sole cost and expense, keep in effect at all times during the term of this Agreement, any licenses, permits, and approvals which are legally required for CONSULTANT to practice his profession.

3) **TIME.** CONSULTANT shall devote such services pursuant to this Agreement as may be reasonably necessary for satisfactory performance of CONSULTANT's obligations pursuant to this Agreement. CONSULTANT shall adhere to the Schedule of Activities as described in their Scope of Service.

4) **CONSULTANT NOT AN AGENT.** Except as CITY may specify in writing, CONSULTANT shall have no authority, express or implied, to act on behalf of CITY in any capacity whatsoever as an agent. CONSULTANT shall have no authority, express or implied, pursuant to this Agreement, to bind CITY to any obligation whatsoever.

5) **ASSIGNMENT PROHIBITED.** No party to this Agreement may assign any right or obligation pursuant to this Agreement. Any attempted or purported assignment of any right or obligation pursuant to this Agreement shall be void and of no effect.

6) **PERSONNEL.** CONSULTANT shall assign only competent personnel to perform services pursuant to this Agreement. In the event that CITY, in its sole discretion, at any time during the term of this Agreement, desires the removal of any person or persons assigned by CONSULTANT to perform services pursuant to this Agreement, CONSULTANT shall remove any such person immediately upon receiving notice from CITY of the desire of CITY for the removal of such person or persons.

7) **STANDARD OF PERFORMANCE.** CONSULTANT shall perform all services required pursuant to this Agreement. Services shall be performed in the manner and according to the standards observed by a competent practitioner of the profession in which CONSULTANT is engaged in the geographical area in which CONSULTANT practices his profession. All products which CONSULTANT delivers to CITY pursuant to this Agreement shall be prepared in a workmanlike manner, and conform to the standards of quality normally observed by a person practicing in CONSULTANT's profession. CITY shall be the sole judge as to whether the product of the CONSULTANT is satisfactory.

8) CANCELLATION OF AGREEMENT. This Agreement may be canceled at any time by the CITY at its discretion upon written notification to CONSULTANT. CONSULTANT is entitled to receive full payment for all services performed and all costs incurred up to and including the date of receipt of written notice to cease work on the project. CONSULTANT shall be entitled to no further compensation for work performed after the date of receipt of written notice to cease work. All completed and incomplete products up to the date of receipt of written notice to cease work shall become the property of CITY.

9) PRODUCTS OF CONSULTING. All products of the CONSULTANT provided under this Agreement shall be the property of the CITY.

Notwithstanding anything to the contrary in this section, the CITY hereby agrees to indemnify, defend, and hold harmless the CONSULTANT from any claims to the extent arising out of the CITY's or any third party's reuse, use, or distribution of its work not within the purposes intended by this Agreement.

10) INDEMNIFY AND HOLD HARMLESS.

a) If AGREEMENT is an agreement for design professional services subject to California Civil Code § 2782.8(a) and CONSULTANT is a design professional, as defined in California Civil Code § 2782.8(c)(2), to the fullest extent allowed by law, CONSULTANT shall hold harmless, defend and indemnify the CITY, its officers, agents, employees, and volunteers from and against all claims, damages, losses, and expenses including attorneys' fees arising out of, or pertaining to, or relating to the negligence, recklessness, or willful misconduct of the CONSULTANT, except where caused by the active negligence, sole negligence, or willful misconduct of the CITY.

b) If AGREEMENT is not an agreement for design professional services subject to California Civil Code § 2782.8(a) or CONSULTANT is not a design professional as defined in subsection (a) above, to the fullest extent allowed by law, CONSULTANT shall indemnify, defend, and hold harmless the CITY, its officers, agents, employees and volunteers from all claims, suits, or actions of every name, kind and description, brought forth on account of injuries to or death of any person or damage to property arising from or connected with the willful misconduct, negligent acts, errors or omissions, ultra-hazardous activities, activities giving rise to strict liability, or defects in design by CONSULTANT or any person directly or indirectly employed by or acting as agent for CONSULTANT in the performance of this Agreement, including the concurrent or successive passive negligence of the CITY, its officers, agents, employees or volunteers.

It is understood that the duty of CONSULTANT to indemnify and hold harmless includes the duty to defend as set forth in Section 2778 of the California Civil Code.

Acceptance of insurance certificates and endorsements required under this Agreement does not relieve CONSULTANT from liability under this indemnification and hold harmless clause. This indemnification and hold harmless clause shall apply whether or not such insurance policies are determined to be applicable to any such damages or

claims for damages.

CONSULTANT's responsibility for such defense and indemnity shall survive termination or completion of this agreement for the full period of time allowed by law.

11)PROHIBITED INTERESTS. No employee of the CITY shall have any direct financial interest in this agreement. This agreement shall be voidable at the option of the CITY if this provision is violated.

12)LOCAL EMPLOYMENT POLICY. The CITY desires wherever possible, to hire qualified local residents to work on city projects. Local resident is defined as a person who resides in Solano County. The CITY encourages an active affirmative action program on the part of its contractors, consultants, and developers. When local projects require, subcontractors, contractors, consultants and developers will solicit proposals from qualified local firms where possible.

As a way of responding to the provisions of the Davis-Bacon Act and this program, contractor, consultants, and developers will be asked, to provide no more frequently than monthly, a report which lists the employee's name, job class, hours worked, salary paid, city of residence, and ethnic origin.

13)CONSULTANT NOT A PUBLIC OFFICIAL. CONSULTANT is not a "public official" for purposes of Government Code §§ 87200 et seq. CONSULTANT conducts research and arrives at his or her conclusions, advice, recommendation, or counsel independent of the control and direction of the CITY or any CITY official, other than normal contract monitoring. In addition, CONSULTANT possesses no authority with respect to any CITY decision beyond these conclusions, advice, recommendation, or counsel.

14)EMPLOYMENT DEVELOPMENT DEPARTMENT REPORTING REQUIREMENTS. When the CITY executes an agreement for or makes payment to CONSULTANT in the amount of \$600 (six hundred dollars) or more in any one calendar year, CONSULTANT shall provide the following information to CITY to comply with Employment Development Department (EDD) reporting requirements:

a) Whether CONSULTANT is doing business as a sole proprietorship, partnership, limited liability partnership, corporation, limited liability corporation, non-profit corporation or other form of organization.

b) If CONSULTANT is doing business as a sole proprietorship, CONSULTANT shall provide the full name, address and social security number or federal tax identification number of the sole proprietor.

c) If CONSULTANT is doing business as other than a sole proprietorship, CONSULTANT shall provide CONSULTANT's federal tax identification number.

EXHIBIT "D"

INSURANCE REQUIREMENTS

CONSULTANT shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the CONSULTANT, its agents, representatives, or employees.

1) MINIMUM SCOPE AND LIMITS OF INSURANCE

- a) Commercial General Liability coverage (occurrence Form CG 00 01) with minimum limits of \$1,000,000 per occurrence for bodily injury, personal injury, products and completed operations, and property damage. If Commercial General Liability or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
- b) Automobile Liability coverage (Form CA 00 01 with Code 1 – any auto) with minimum limits of \$1,000,000 per accident for bodily injury and property damage.
- c) Workers' Compensation insurance as required by the State of California and Employers' Liability insurance, each in the amount of \$1,000,000 per accident for bodily injury or disease.

2) INDUSTRY SPECIFIC COVERAGES

The following insurance is also required.

- Professional Liability Insurance / Errors and Omissions Liability in the minimum amount of \$1,000,000 per claim and in the aggregate.

3) INSURANCE PROVISIONS

a) **DEDUCTIBLES AND SELF-INSURED RETENTIONS.** Any deductibles or self-insured retentions must be declared to and approved by the CITY. At the option of the CITY, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the CITY, its officers, officials, employees and volunteers; or the CONSULTANT shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

b) The general and automobile liability policies (and if applicable, pollution liability, garage keepers liability and builder's risk policies) are to contain, or be endorsed to contain, the following provisions:

- i) The CITY, its officers, officials, employees and volunteers are to be covered as additional insureds as respects: liability arising out of work or operations performed by or on behalf of the CONSULTANT; products and completed operations of the CONSULTANT; premises owned, occupied or used by the

CONSULTANT; and automobiles owned, leased, hired or borrowed by the CONSULTANT. The coverage shall contain no special limitations on the scope of protection afforded to the CITY, its officers, officials, employees or volunteers.

- ii) For any claims related to this project, the CONSULTANT's insurance coverage shall be primary insurance as respects the CITY, its officers, officials, employees and volunteers. Any insurance or self-insured maintained by the CITY, its officers, officials, employees or volunteers shall be excess of the CONSULTANT's insurance and shall not contribute with it.
- iii) Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the CITY, its officers, officials, employees or volunteers.
- iv) The CONSULTANT's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
- v) Each insurance policy required by this clause shall be endorsed to state that coverage shall not be canceled except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the CITY.
- vi) The policy limits of coverage shall be made available to the full limits of the policy. The minimum limits stated above shall not serve to reduce the CONSULTANT's policy limits of coverage.

c) ACCEPTABILITY OF INSURER. Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII, unless otherwise acceptable to the CITY.

d) VERIFICATION OF COVERAGE. CONSULTANT shall furnish the CITY with original endorsements effecting coverage required by this Exhibit D. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. The endorsements are to be on forms provided by the CITY or on forms equivalent to CG 20 10 11 85 subject to CITY approval. All insurance certificates and endorsements are to be received and approved by the CITY before work commences. At the request of the CITY, CONSULTANT shall provide complete, certified copies of all required insurance policies, including endorsements effecting the coverage required by these specifications.

e) SUB-CONTRACTORS. CONSULTANT shall require all subcontractors to procure and maintain insurance policies subject to the requirements of Exhibit D. Failure of CONSULTANT to verify existence of sub-contractor's insurance shall not relieve CONSULTANT from any claim arising from sub-contractors work on behalf of CONSULTANT.